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upward movements of the region; the effect of the earliest movement having now been propagated nearly to the head of the stream, while the latest elevation has caused a deepening of the valley only near its mouth. (The lateral terraces that might be expected if this explanation were true are not mentioned.) The extremely meandering course of many deep valleys in the plateau is ascribed to lateral erosion on convex curves of originally irregular courses, and not to perpetuation of meanders originally developed on upland surface and somewhat increased during the incision of the present valleys.

THE RIVERS OF SPAIN.

THIS large subject is treated in a descriptive manner, with especial reference to the value of rivers for irrigation and navigation, by R. Torres-Campos (Bol. Soc. geogr. Madrid, xxxvii., 1895, 7-32, 81-140). The excessive aridity of many river basins and the dependence of agriculture on irrigation are the themes of many pages. In the basin of the Ebro, for example, irrigating canals create productive farms, sustaining a dense population; but away from the streams there is neither tree nor bush, and one may there travel 'leagues and leagues' without seeing the trace of human habitation. The dryness of this region has obliged many of the laboring classes to emigrate. Some go to South America, some to France; and the improved condition of the few who return stimulates the departure of others. On parts of the coast of Valencia the streams from the mountains have built out a sloping plain of fertile alluvium, where the construction of roads and canals has been so easy that the region is occupied by a prosperous and progressive population. No consideration is given by the author to the origin of the rivers or to the present stage of their development.

W. M. DAVIS.

HARVARD UNIVERSITY.

SCIENTIFIC NOTES AND NEWS.

FIELD WORK OF U. S. GEOLOGICAL SURVEY.

DIRECTOR WALCOTT, of the U. S. Geological Survey, has returned to Washington, after a two months' absence in the northern Rocky Mountain region, spent in field work. He was studying the Cambrian rocks and faunas of Montana and Idaho.

The field work of the season is drawing to a close. Nearly all the geologic parties have come in, though work is still going on on the Pacific coast, and, to a small extent, in the Interior or Mississippi basin. Work in the northern Rocky Mountain region and in Washington was brought to a stop early in October by severe storms. In this region Mr. Emmons and Mr. Willis were at work as well as the director. The special work in Alaska, an examination of the gold and coal resources, was advanced so far as conditions would permit, and Drs. Becker and Dall are now in Washington preparing their joint report on the subject. Since submitting to the Secretary of the Interior his report on the character of the lands involved in the McBride claim in Washington, Mr. W. Lindgren, who made the expert examination for the Government in that case, has been mapping the geology of the mining region of northern-central California.

Topographic work is still in progress in all quarters. The number of sheets surveyed is unusually large and the work is generally of excellent character. Surveys are, or have been, in progress in about twenty-five States and Territories. The Chief Topographer, Mr. Henry Gannett, made an inspection of the work, especially that in the West. The work going on in Indian Territory is of special interest because of the peculiar conditions governing it. Here, in connection with the regular topographic mapping, a subdivisional or parceling survey is being made in the interest of the General Land Office. This

work was much retarded in the summer months, partly by the illness of the men, due to the prevalence of malarial fever, and partly by other unforeseen obstacles; but the conditions have improved and the work is now advancing with gratifying rapidity. This work will go on all winter.

Director Walcott will shortly prepare a succinct report of the operations of the field season, for the information of the Secretary of the Interior, briefly reviewing the work in all its branches.

THE 'INSTITUT PASTEUR'.

The Paris correspondent of *The Lancet* gives in the issue of October 26 an interesting description of the Institut Pasteur, from which we quote the following facts:

The Institute is the property of a company, but having been recognized by the Government *d'utilité publique* it is under the control of the State (Home Office). The *Assemblée* is made up of founders; by it the Council is elected, the accounts passed, etc. The revenue is derived from the following sources: (a) the interest of 1,200,000 fr., balance of the sum of nearly 3,000,000 fr., publicly subscribed, about two-thirds of which was absorbed by the acquisition of the land upon which the Institute stands and by the building of the said Institute; (b) a subvention of between 20,000 fr. and 30,000 fr. made by the Agricultural Department for services rendered ('vaccinations' of animals against charbon, glanders, etc.); (c) a subvention (sum not mentioned) of the Ministry of Public Instruction to provide for the salaries of such officials as belong formerly to the *École des Hautes Études*; (d) profits derived from the sale of vaccines supplied at a low rate to veterinary surgeons, these profits having been ceded to the Institute by M. Pasteur and by MM. Roux and Chamberland (the revenue from this source reaches about 20,000 fr. per annum); and (e) fees paid

by the bacteriological students of the Institute.

The anti-diphtheric department, directed by Dr. Roux under the dual control of the Council of the Institute and the Ministry of the Interior, is an *annexe* of the Institute but has a distinct budget. The headquarters of this department are at Garches (where Pasteur died), on a property ceded to Pasteur by the State. The serum is distributed gratis, according to the demands of the Ministry of the Interior, to the army and to the hospitals and *bureaux de bienfaisance* of France and her colonies. The expenses are met by the interest of the public subscription (collected by the *Figaro*) and by a sum voted annually by Parliament (this year it amounted to 80,000 fr.). The serum is supplied to the public under the provisions of the Pharmacy Law, a small bottle being procurable at every druggist's for 3 fr. Any profit accruing from the sale will be devoted to the improvement of the particular *service*. The work done at the Institute comprises inoculations and lectures delivered by Drs. Roux and Metchnikoff, whose pupils are divided into two categories—those who are simply listeners and those who come to acquire the technique of bacteriology. There are, moreover, laboratories provided for investigators engaged in original research, the results of whose work are chronicled in the '*Annales de l'Institut Pasteur.*' The teaching *personnel* is as follows: Biological chemistry, M. Duclaux, who is besides professor at the Faculty of Sciences, but who now gives his lectures at the Institute instead of at the Sorbonne, as was the case formerly. Rabies: Professor Grancher, with the collaboration of Drs. Charrin and Chantemesse. Sanitary bacteriology, 'vaccinations' and practical applications: M. Chamberland. Morphological bacteriology: Dr. Metchnikoff. Technical bacteriology: Dr. Roux. Finally, Professor Nocard, of the Alfort Ve-

terinary College, superintends a veterinary service attached to the Institute. The Institute, opened in 1888, will continue its activity under the same constitution as under its late chief.

THE PHENOMENA OF FRICTION.

M. RAFFARD has extracted from the technological publications of the *Société des Anciens Elèves des Écoles nationale d'Arts et Métiers*, August, 1895, a paper* in which he summarizes the earlier work of Amon-ton (1699), of Coulomb (1781) and of Morin, Krest and Haton de la Goupillière in our own times, and proceeds to the discussion of his own recent experiments, particularly on the friction of cords and belts on pulleys and cylinders about which they may be wrapped. As early as 1880 he had noted the fact that the friction of such flexible wrapping connections was very slight at low velocities rapidly increasing with acceleration of speed, and had presented the results of his work to the Society (Trans. 1880, p. 671). The experiments of Holman (Jour. Franklin Institute, Sept. 1885) confirm his own conclusions. Giving Holman's graphical illustration of the relation of friction of slipping belts to speeds, he makes the following final deductions:

1. In sliding friction the relative motion of the bodies is in line of the resultant of the applied forces.

2. With rolling friction the resistance remains substantially the same as when starting from rest, both in the plane of rotation and transversely to that plane, and a wheel will roll in its own plane, until the adherence is broken either by lateral or by circumferential stress, when it will at once take up a line of motion corresponding to the resultant of the acting forces.

3. The coefficient of friction of belts on

* *Considérations sur les Phénomènes du Frottement*, N. J. Raffard, Paris, 1895. Pamphlet monograph. Pp. 15, 4.

turned and polished pulleys is at starting and at low velocities but about one sixth its magnitude at high speeds of relative motion.

GENERAL.

A BIOGRAPHY of Huxley is being prepared by his son, Mr. Leonard Huxley. *Nature* states that Mr. Huxley will be greatly obliged if those who possess letters or other documents of interest will forward them to him at Charter House, Godalming. They will be carefully returned after having been copied.

DR. HERBERT H. FIELD, whose address at present is 67 Rue de Buffon, Paris, announces that arrangements have just been made with Engelmann, of Leipzig, for a 'Bibliographia Zoologica,' and with Fischer, of Jena, for a 'Bibliographia Anatomica.' The former will be sold in book form annually at \$3.75, while in the card form it will be issued at the rate of \$2.00 per thousand cards. Dr. Field announces that it is necessary to secure 75 subscriptions to the Bibliography, in book or card form, in the United States. This will be the most complete and systematic bibliography which has ever been issued, and deserves the prompt and generous support of zoölogists in all parts of this country. Subscriptions should be addressed directly to Dr. Field.

The Indian Engineer, a journal which has been published for quite a number of years in Calcutta, has recently changed its name to *The Indian and Eastern Engineer*, and extended its scope accordingly. Its object is to make engineers in the East acquainted with the best methods, American, English and Continental, employed in the industrial arts. Publications and articles descriptive of the arts and industries will be gladly received by the editor for republication in his journal. The editor of this journal is C. W. Merton, 137 Cannings Street, Calcutta, India.

OLZEWSKI recently succeeded in producing a momentary liquefaction of hydrogen by allowing it to expand suddenly from 140 atmospheres' pressure, when cooled to about $-210^{\circ}\text{C}.$ with liquid air or oxygen boiling under a pressure of less than 20mm. Its boiling point under atmospheric pressure was found to be $-243.5^{\circ}\text{C}.$, only 30° above absolute zero. In a letter to Ramsay (*Nature*, Oct. 3) he now announces that under the same conditions *helium* shows no sign of liquefaction. Its boiling point is therefore still lower than that of hydrogen, and it is the most volatile substance known. In view of the great difficulty in reaching still lower temperatures, it would seem that the present methods will have to be considerably improved before helium can be liquefied.

CASSEL & Co., London, and Macmillan & Co., New York, will publish shortly: 'Clerk Maxwell and Modern Physics' by R. T. Glazebrook. Other volumes of the Century Science Series are: 'Michael Faraday, his Life and Works,' by Sylvanus P. Thompson; 'Humphrey Davy,' by T. E. Thorpe; 'Pasteur, his Life and Work,' by M. Armand Ruffer; 'Charles Darwin and the Origin of Species,' by Edward B. Poulton; and 'Hermann von Helmholtz,' by A. W. Rücker.

MACMILLAN & Co. are about to issue a second edition of *Mental Development in the Child and the Race*, by Prof. J. Mark Baldwin. The only important alteration is the correction in the tables on page 51.

INASMUCH as New Jersey has now been covered by the topographical maps of the Survey, Mr. Henry Gannet has been enabled to prepare a dictionary of all the names on them and to give references to the particular sheets on which they occur. The dictionary facilitates very much the locating of obscure places, such as villages, brooks, hills, etc., and enables one to quickly acquire a map of any portion of the

State. The dictionary is published as Bulletin 18 of the U. S. Geological Survey.

MR. EDWARD WHEELER PARKER has extracted from the sixteenth annual report of the Director of the United States Geological Survey his paper on the Production of Coal in 1894. After a brief introduction, descriptive of our American coal fields, a review of the production and labor statistics follows. A coal-trade review by business centers appears next, and then an account of recent official tests of various coals by the Navy Department. The bulk of the paper is occupied by the review of the several coal-producing States in alphabetical order. A geographical outline of the productive fields comes first, followed by statistics alike of output, labor, expenses, accidents and similar facts. Although concise, the paper is thorough and maintains the high character that has been established by the volumes on Mineral Resources.

THE *Critic* states that an interesting collection of weapons, ornaments, etc., gathered in Africa by the young explorer E. J. Glave, is exhibited at the office of The Century Co., in whose service Mr. Glave met his death in the Dark Continent, last May.

It is stated that of 597 trees struck by lightning in the forest near Moscow 302 were white poplars; and farmers are advised to plant these trees as protectors against lightning.

D. JAMES E. GARRETSON, dean of the Philadelphia Dental College, and known for his scientific contributions on diseases of the mouth, died on October 27th, at the age of 67 years.

MR. ROBERT BROWN, a distinguished botanist and traveller, died in London on October 27th, at the age of 53. Dr. Brown travelled extensively in North America and North Africa, and made important scientific contributions to botany, geology and zoölogy.

PROF. WILLIAM ABBOT PIKE died from pneumonia at Minneapolis on October 13th. He was for some years professor of engineering in the Maine State College and later held the same position in the University of Minnesota.

BARON LARRAY, member of the French Institute and of the Academy of Medicine, and known for his contributions to military surgery, died on October 8th, at the age of 87.

THE Manchester Museum has obtained a grant of £400 from the taxes collected for free libraries, which amount to about £20,000.

THE German Hygienic Association has offered a prize of 12,000 Marks for a paper on the efficiency of electric heaters. The essays must be written in German and sent to Professor Konrad Hartmann, Charlottenburg, not later than July 1, 1896.

THE *Popular Science Monthly* opens its forty-eighth volume in November under the name *Appleton's Popular Science Monthly*, with typography and paper materially improved. The journal will hereafter be published in England by Kegan, Paul, Trench, Trübner & Co. The ten articles of the current number are all concerned with anthropology, using this word in a wide sense. Professor Brinton's president's address before the A. A. A. S. is given, and among the other papers of interest is an illustrated article by Mr. H. P. F. Marriott, entitled 'Primigenial Skeletons, the Flood and the Glacial Period.'

SEVERE earthquake shocks were felt in the central States just after 5 o'clock on the morning of October 31st, affecting especially Ohio, Illinois and Indiana. On the following day, at 5:40 in the morning, violent shocks were felt at Rome. The convent of Santa Maria Maggiore was greatly damaged. A portion of the outer wall was overthrown and part of the ceiling has fallen. Four

palaces and the Bank of Italy were so shaken that they are rendered unsafe for occupancy.

A MUNICIPAL museum was opened at Alexandria on September 26th containing a collection of antiquities belonging to the Greek, Roman and early Coptic periods. The municipality and the Alexandria Archaeological Society are making excavations in the city and neighborhood, but hitherto their researches have proved only negative.

THE daily papers state that the Board of Managers of St. Luke's Hospital, New York, at a recent meeting decided to erect on the new site of the hospital, at One Hundred and Eighteenth street and Morningside avenue, a large building to be devoted exclusively to researches in pathology. It is to be specially devoted to investigation of dangerous micro-organisms. The managers appointed a committee with full power to erect the building, and declared it their opinion that an endowment fund of \$200,000 should be obtained and set aside for the pathological department. The plans of the new building have already been drawn up and will be submitted to the Medical Board in a few days. The building as designed will be one of the finest and most complete in appointments of any similar structure in America.

D. APPLETON & Co. announce two new volumes in the International Scientific Series, *Greenland Icefields*, by Prof. G. Frederick Wright, and *Movement*, by E. J. Marey.

THE French Association for the Advancement of Science will hold its next meeting in Tunis in April, 1896. In 1897 it will meet in St. Etienne. M. Distère, marine engineer, has been elected president of the Association and Dr. Leon Teisserenc de Bort general secretary.

DR. W J MCGEE, of the Bureau of American Ethnology, has started to explore

the hitherto unknown portion of Sonora county, Mexico, and Tiburon Island, on the coast of Mexico, inhabited by the Seri Indians, noted for their treacherous blood-thirstiness.

ACCORDING to *Nature* the Catalogue of the Library of the Royal Geographical Society, compiled by Dr. H. R. Mill, and lately published, is a very full and valuable index to the literature of geography. The Catalogue contains the titles of all works in the possession of the Royal Geographical Society published up to the close of 1893. The entries (amounting to as many as 18,000) are arranged in four divisions. The first division, which runs into 521 of the 833 pages, is a general alphabetical author's catalogue; the second comprises collections of voyages and travels, arranged in alphabetical order under authors' names, and containing a brief analysis of the contents of each volume; in the third division, government, anonymous and other miscellaneous publications are arranged geographically; while the fourth consists of a list of transactions and periodical publications, arranged in a similar manner according to the place of publication. With such a comprehensive classification, it is easy to find the works of each author and to refer to the literature concerning different divisions of the earth. A valuable supplement to the Catalogue will be the subject index now being prepared and in which the principal contents of all the geographical books and periodicals belonging to the Society will be classified.

A MONUMENT to Duchenne by M. M. Desvergnès and Débrie will shortly be erected in the Salpêtrière. It is also proposed to erect a memorial to Duchenne in his native city of Boulogne.

It is said that Professor Wollny, of Munich, has made some experiments which prove the utility of angle-worms for agri-

cultural purposes. He raised peas, beans, potatoes and other vegetables in wooden boxes, some with and some without worms, and in each case the presence of worms led to an increase in the crop, varying from twenty-five per cent. in the peas to ninety-four per cent. in the rye.

THE Canadian Medical Association will hold its annual meeting for 1896 in Montreal under the presidency of Dr. James Thorburn.

THE total number of new students who have entered the twelve London medical schools is 581, as compared with 552 in 1894.

MR. C. H. COCHRANE states in Lippincott's Magazine that the National Rapid Transit Company is asking the United States Senate for privileges looking to the establishment of a line between New York and Washington, and specifying in the proposed bill that the schedule time shall not be less than one hundred miles an hour, which necessitates a speed of a hundred and twenty miles per hour to cover loss from stops. Further, the General Electric Company of New York is willing to guarantee motors, generators and other electric mechanism for such a road, warranting them to maintain a speed of one hundred and fifty miles an hour when delivering a hundred horse-power per motor with two motors per car.

The New York Evening Post states that the documents of the Arctic explorer Jackson, brought back from Franz Joseph Land by the *Windward*, have been opened in London. They record that the expedition landed on September 7, 1894, at Cape Flora, where log houses were erected and a tempestuous winter was spent. Jackson and two others started north March 10, 1895, with two ponies and two sledges. The temperature was sometimes 45 degrees below zero. The country generally was 2,500 feet above sea level and was covered with

ice sheets, interrupted along the coast by high basaltic cliffs. The journey revealed many inaccuracies in the charts. The farthest point reached was latitude 81 degrees 20 minutes north, where two boats were left for use later in the summer. Many specimens were taken, which show that the geological formation of the land is mainly basaltic. A second journey began in April and ended in the middle of May. It was attended with stormy weather, and frequently the temperature was 50 degrees below zero. Jackson considers horses the best means of reaching a high latitude up to the end of April.

THE *Times* states that a series of archaeological discoveries have been made at Monkwood, near Bath, where a reservoir is being constructed to supplement the water supply of the city. The latest discovery was unearthed on Thursday from a mass of peaty deposit. It is an iron hatchet with a handle formed of a human leg bone. Round the socket is a rough ferrule of lead. The metal head was kept firm by means of wooden plugs, traces of which were found clinging to the iron. This is the only relic of the iron age discovered, but oölitic flint hammer heads and an interesting collection of bronze weapons and articles of personal adornment have been brought to light. These discoveries have been inspected by Professor Boyd Dawkins and other paleontologists. The bones of extinct mammalia have also been met with. The discoveries are in the charge of Charles Gilby, city engineer of Bath.

UNIVERSITY AND EDUCATIONAL NEWS.

THE corner stone of the new dormitory buildings of the University of Pennsylvania was laid on November 5th, Judge Robert M. Willson, Provost Charles C. Harrison and Bishop O. W. Whitaker taking part in the ceremonies. The dormitories are due to the initiative of Vice-Provost George

Stuart Fullerton and are planned on an elaborate scale, it being estimated that \$1,000,000 will be required to complete the buildings. They will include a dining hall and a chapel in addition to forty-four houses, forming one continuous building. Each house will have a separate staircase and will accommodate twelve to fourteen students with bedrooms, sittingrooms and bathrooms. There will be two courts, one triangular and one rectangular, separated by cloisters. The sixteen houses forming the triangle are already in course of erection and will be ready for occupation at the opening of the next academic year.

THE Public Hall of the University of Virginia, and the Rotunda, which contained the library, were completely destroyed by fire on October 27th. The loss is estimated at from \$150,000 to \$250,000, with an insurance of \$25,000. Efforts are already being made to collect money to restore the buildings, as they were before their destruction, and had been planned by Jefferson. A large part of the books in the library were saved, but many valuable papers and rare books that can never be replaced were destroyed.

THE trustees of Cornell University have voted \$2800 to build a small working observatory for the College of Civil Engineering.

THE *Bulletin of the American Mathematical Society* announces the following appointments: Prof. Samuel L. Barton, recently of the Virginia Agricultural and Mechanical College, to be professor of mathematics in the University of the South, Seewanee, Tenn.; Dr. Alex. Macfarland, formerly professor of physics at the University of Texas, to be lecturer in Lehigh University; Dr. E. B. Van Vleck, formerly of the University of Wisconsin, to be associate professor of mathematics in Wesleyan University, and Prof. C. A. Waldo, of De Pauw Univer-